



Report to Council

From the Office of Councillor Steve Milani

Date: March 1, 2021
Subject: Sustainable Building Practices

Purpose

For Council to consider phasing out the use of concrete as the main component of buildings over six storeys in height as tall concrete buildings are not sustainable and continuing to build them works against the Climate Action Plan, which was endorsed by Council on July 21, 2020.

Recommendation

THAT staff report back to Council with options and recommendations on how best to:

- a) prioritize and incentivize Mass Timber (Cross-Laminated Timber (CLT)) construction for buildings over six storeys in height; and**
- b) phase-out the use of concrete as the main component of buildings over six storeys in height;**

as recommended in the report dated March 1, 2021 from the Office of Councillor Steve Milani regarding Sustainable Building Practices;

AND THAT this item be classified as High Priority to address the current state of climate emergency.

Background

In June of 2019, the City of Port Moody declared a state of climate emergency. Oxford Dictionaries defines a 'climate emergency' as "a situation in which immediate action is needed to reduce or stop climate change and prevent serious and permanent damage to the environment". In July of 2020, City Council endorsed the Climate Action Plan. One of the six goals included in the plan is to cut the carbon content of construction projects by 40% (compared to 2018) by the year 2030. Committing to it is the first step, the next is action, which is where this report comes into play.¹

Discussion

Tall concrete buildings such as high-rises are not sustainable and constructing them should no longer be permitted in Port Moody. The recommendations in this report are not meant to affect those development applications that have already passed first-reading.

¹ <https://www.portmoody.ca/en/city-hall/climate-action-plan.aspx#Our-Plan-was-developed-with-input-from-the-community>

In Canada, a building that is ten storeys or more in height is considered a high-rise while a building with forty or more stories and taller than 150 m (490 ft) is generally considered a skyscraper. The inefficiencies resulting from concrete high-rise construction have been known for years. In the past, profit seemed to take precedence over environmental concerns. In an article dating back to 2012, Patrick Condon of the University of British Columbia states, “Our high-rises, according to BC Hydro (the province of British Columbia’s main electric utility) data, use almost twice as much energy per square metre as mid-rise structures.” He goes on to say, “... high-rise buildings built largely of steel and concrete are less sustainable than low-rise and mid-rise buildings built largely of wood; steel and concrete produce a lot of GHG. Wood traps it. Concrete is 10 times more GHG-intensive than wood.”²

A study published in October of 2019 in the International Journal of Environmental Science and Technology examined the carbon footprint of a residential tower during the construction phase and concluded the following: This paper assessed all sources of carbon emissions in the construction phase, including emissions from manufacturing and extraction of building materials, transportation of building materials, construction equipment, vegetation cover around the building, and transportation of construction waste. According to the results, the highest amounts of carbon footprint were estimated at 83% and 14%, which were, respectively, related to the emissions from the transportation of materials and construction wastes. The emissions from the construction phase accounted for 3% of the total footprints. Also in the manufacturing process of building materials, the highest contributions in CO₂ emissions were 78%, 10%, and 6%, belonging to concrete, rebar, and cement mortar, respectively.³

In a wonderful opinion piece, entitled, “High-rises are energy hogs, not climate solutions” the author states that in addition to the “embodied energy” of high-rise buildings being substantially higher than that of other building types, data collected by the City of Seattle as a result of its Energy Benchmarking and Reporting Program indicates that multi-family buildings higher than nine stories, currently use 60 percent more energy per square foot than comparable four-story or five-story buildings.⁴

Page 32 of the Climate Action Plan states the following under the heading of Buildings:

14.2 Goals

Design/construct/renovate buildings that:

- Are durable and more likely to withstand or recover quickly from the anticipated effects of climate change;
- Use relatively little energy to operate; and
- Provide a healthy indoor environment with good air quality.
- Design/construct/renovate buildings with:
 - Materials that are associated with low levels of embodied carbon; and
 - Materials that store carbon.

² <https://ourworld.unu.edu/en/a-city-that-runs-on-itself>

³ <https://link.springer.com/article/10.1007/s13762-019-02557-3>

⁴ https://crosscut.com/2016/11/high-rises-run-counter-to-the-citys-environmental-goals?fbclid=IwAR3ub1UYQgGw0iWf3SEeM1sD6QnwrGZ1DXi_t2VTOnf90U5AcWGBa1Wqjnc

Use sources of energy that produce lower amounts of greenhouse gas emissions and energy systems that are more likely to withstand or recover quickly from disruptive events.

Mass Timber construction, also known as CLT (cross-laminated timber) meets the Climate Action Plan criteria while concrete construction does not. A building material with a long-standing history in construction, Mass Timber is recognized as being a durable and sustainable building option. Lighter and more efficient to use than other structural materials, engineered wood carries much less of an environmental footprint than concrete, which produces up to 8% of the world's emissions. Originally a Swiss invention, CLT has been the norm in Europe for decades while in North America, its uses have been hampered by years of conservative building regulations. The foundations and underground parking garages of Mass Timber buildings are still primarily formed using concrete.

The following excerpt was taken from the Think Wood website.⁵

Here are 4 things the Mass Timber Code Coalition wants you to know about Mass Timber:

1. Mass Timber is Fire Resistant

- During a fire resistance test of a 5-ply cross-laminated timber (CLT) panel wall, the panel was subjected to temperatures exceeding 1,800 Fahrenheit and lasted 3 hours and 6 minutes, far more than the two-hour rating that building codes require.
- During fires, exposed mass timber chars on the outside, which forms an insulating layer protecting interior wood from damage. Additionally, when the code requires mass timber to be protected with gypsum wallboard, the mass timber can achieve nearly damage-free performance during a contents-fire burnout event.

2. Mass Timber is Strong

- Recent mass timber buildings weigh approximately 1/5th that of comparable concrete buildings, which in turn reduces their foundation size, inertial seismic forces, and embodied energy. High strength-to-weight ratios enable mass timber to perform well during seismic activity.

3. Mass Timber is Sustainable

- Replacing steel with mass timber would reduce carbon dioxide emissions by between 15% and 20%.
- By some estimates, the near-term use of CLT and other emerging wood technologies in buildings 7-15 stories could have the same emissions control effect as taking more than 2 million cars off the road for one year.
- The fire tests confirmed that mass timber structures meet and generally exceed the fire resistance requirements in the current code. Studies have shown that building with wood produces fewer greenhouse gas emissions than building with other materials.

4. Mass Timber Makes Construction Cost-efficient

⁵ <https://www.thinkwood.com/blog/4-things-to-know-about-mass-timber>

- Mass timber buildings are roughly 25% faster to construct than concrete buildings and require 90% less construction traffic.
- Since mass timber panels are prefabricated and then assembled on-site, buildings made from mass timber have much shorter project timelines and safer construction sites.

Less construction noise and related traffic are only a couple of the benefits of using mass timber over concrete, here are a few more.

- Wood is a natural insulator and has a lower thermal conductivity compared to concrete, steel-frame, and masonry construction and is ideally suited to energy-efficient design. This efficiency translates to less heating and cooling costs which results in less GHG emissions. A Port Moody resident currently living on the 25th floor of a 26 storey tower said that they spend as much to cool their condo as they do to heat it.
- “As our economy bounces back from the COVID-19 crisis, we want to do everything we can to support forest workers,” said Premier Horgan. “By focusing on mass timber, we have an opportunity to transition the forestry sector to high-value over high-volume production. This will mean opportunities for local workers, strong partnerships with First Nations, and greater economic opportunity while making a significant contribution to advancing CleanBC.”⁶
- A very important fact to consider is that all land surrounding the Burrard Inlet in Moody Centre, Inlet Centre, and Pleasantside neighbourhoods is susceptible to soil liquefaction⁷ as referenced in OCP Map 14 - Hazardous Lands.⁸ The lighter weight of Mass Timber buildings makes them far less likely to trigger liquefaction in the event of an earthquake.⁹
- There is a growing body of evidence internationally demonstrating that connection to nature, biophilic design, and wood, exposed wood in this case, is associated with improved physical and mental wellbeing. Biophilia (meaning love of nature) focuses on human’s innate attraction to nature and natural processes.

Environmentally Friendly ‘Circular Construction’

Circular construction is achieved by using sustainable materials and construction processes. Mass timber is circular as its components can be dismantled and reused while concrete structures are poured into place requiring them to be demolished when reaching their useful life.

Building materials should be assessed in terms of their life cycle in order to achieve maximum circular potential. Starting to shift into more reconstructable materials and designs will allow engineers, constructors, and designers to depend less on energy-intensive and heavy emitting materials such as concrete and steel.

⁶ <https://news.gov.bc.ca/releases/2020PREM0033-001076>

⁷ https://en.wikipedia.org/wiki/Soil_liquefaction

⁸ <https://www.portmoody.ca/en/business-and-development/resources/Documents/map-14-hazardous-lands.pdf>

⁹ <https://cdn.britannica.com/84/152184-050-0C74FF5D/qualities-soil.jpg>

Sustainability ¹⁰

Unlike concrete, building with mass timber has a number of environmental benefits. Life cycle assessments show that wood outperforms both steel and concrete in terms of energy, air pollution, and water pollution.

Carbon storage is an important component of building with CLT. A healthy tree in a forest will release oxygen and store carbon dioxide (CO₂). Using mass timber as a building product reduces the carbon footprint by also storing carbon dioxide (CO₂) in the same way a healthy tree would. To put it into perspective, it is believed a single five-storey, cross-laminated timber building will cut emissions by levels equivalent to removing up to 600 cars from the road for a year.

In British Columbia, large amounts of CLT are made from Mountain Pine Beetle-kill wood. If those dead trees were to remain in the forest, they would emit CO₂ into the atmosphere instead of storing it. However, if trees have already died due to pine beetle contamination, the timber is still sound and usable for construction for up to 10 years. By utilizing that wood before it goes to waste, CLT becomes a building product that not only sequesters tonnes of carbon but also reduces greenhouse gas emissions during construction through the prefabrication process.

CLT also outperforms concrete when it comes to job site waste. Since most or all CLT panels are prefabricated, there is little to no waste on-site. Manufacturers can also re-use any scraps for stairs or other architectural elements.

How will the city meet growth targets if concrete high-rise buildings are no longer permitted?

If Port Moody's current population of approximately 36,000 is added to the projected population numbers for all approved and applications in progress, the City should reach a population of approximately 49,000. If preliminary applications are also factored in, the 2041 population target of 50,000 will have been met. These population projections do NOT include Coronation Park, Moody Centre TOD, and Flavelle Oceanfront which come to 21,867 for those projects alone. Adding them in would bring the collective total to over 70,000 people which is more than double our current population.

These projected numbers do NOT take into account any development applications applied for over the next 20 years. It would not be logical to think there will be zero development applications submitted in two decades, so reaching our population target is not an issue should future concrete high-rise buildings be banned from being built in the city.

¹⁰ <https://www.structurlam.com/whats-new/news/concrete-vs-cross-laminated-timber/#:~:text=Despite%20being%20five%2Dtimes%20lighter,panel%20spans%20in%20two%20directions.&text=Buildings%20using%20mass%20timber%20carry,minimizing%20cost%20and%20building%20time>

From the City's website: From time to time, the City reviews growth scenarios for the long term by estimating potential buildout overtime. This table¹¹ is a summary of recently approved applications, proposals currently in the pipeline for Council consideration as well as areas slated for development in the next 10 - 30 years. These numbers provide a tentative indication of what the population growth might be under the assumption that current development applications would all be approved and constructed by 2050.

On May 26, 2020, Council approved the Tall Wood Early Adoption Initiative which allows for the construction of mass timber buildings up to 12 storeys in height which can provide additional density if required¹². Questions about fire safety were addressed in an attachment included with the report¹³.

With both the Climate Action Plan and Tall Wood Early Adoption Initiative now in place, the City of Port Moody has the opportunity to lead by example by banning concrete high-rise buildings within the city, setting the stage for other municipalities to follow. "It's not just words. Action expresses priorities." Mahatma Gandhi

Other Option(s)

THAT staff report back to Council with options and recommendations to prioritize and incentivize mass timber construction.

Financial Implications

The financial implications are the staff time to prepare a report. .

Communications and Civic Engagement Initiatives

There are no communications and civic engagement initiatives related to this report.

Council Strategic Plan Objectives

The recommendation in this report aligns with the Council's Strategic Priorities under the heading of Environmental Leadership.

Maintain and enhance Port Moody's natural and built assets while reducing the impact on our planet.

- Inspire environmental actions and advocacy.
- Reduce the City's impact on the planet.

Expand and enhance policies to guide environmental goals and sustainability programs.

- Review and update existing environmental policies on a regular basis to find leadership opportunities.

Provide leadership in climate change by thinking globally and acting locally.

- Respond and adapt to climate change through planning and policy development.

Address global climate change with local actions.

¹¹ https://www.portmoody.ca/en/business-and-development/resources/Documents/Development_Horizon_Pipeline_Projects.pdf

¹² <https://pub-portmoody.escribemeetings.com/filestream.ashx?DocumentId=8207>

¹³ <https://pub-portmoody.escribemeetings.com/filestream.ashx?DocumentId=8208>